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## **DUCT INSULATION**

Heating and Cooling System Improvements

Air distribution system ducts are designed to supply conditioned air from heating and cooling equipment to the living spaces and return an equal volume of air from the living spaces back to the heating and cooling equipment to be reconditioned. Ducts are typically located in unconditioned spaces such as attics, crawlspaces, garages, or unfinished basements and are made of thin materials (like sheet metal) that conduct heat easily. Due to extreme winter and summer temperatures in these spaces, 10 percent to 30 percent of the energy used to heat and cool the air is lost through the duct surfaces. In order to maintain temperatures at a comfortable level, the heating and air conditioning equipment has to work harder to make up for these losses. Thus, uninsulated or poorly insulated ducts reduce the efficiency of the heating and cooling systems and increase energy bills.

Uninsulated or poorly insulated ducts can also cause occupant discomfort, especially during the winter months. As conditioned air moves through uninsulated ducts, it loses heat through conduction. As a result, rooms served by long duct runs can experience "cold blow" because they typically have lower heating supply air temperatures. This problem can be more pronounced with heat pumps that deliver air at lower temperatures. Even when the furnace or air conditioner is not operating, heat loss occurs due to conduction through the duct surfaces.

The need for insulation can be reduced if the ducts are located within the conditioned space. In this location, any conductive losses and gains would be minimal since ducts would be exposed to indoor air temperatures. Some insulation is still required to ensure that the conditioned air is delivered at the desired temperature, and to prevent condensation on duct surfaces.

As shown in Figure 1, insulation R-values should be selected based on climate and duct location. The EPA recommends proper insulation of ducts as a means of improving system efficiency and lowering energy bills.

FIGURE 1: Cost Effective Duct Insulation R-Valuesa

If you live in a climate that is	An your heating system₅ is a	Insulate to these levels in the	
		Unheated/unconditioned attic	unheated/unconditioned basement/crawlspace
Warm with cooling and minimal heating requirements (i.e., FL & HI; coastal CA; southeast TX; southern LA, AR, MS, AL & GA).	Gas/oil or heat pump	R-4 to R-8	none to R-4
	electric resistance	R-4 to R-8	none to R-4
<b>Mixed</b> with moderate heating and cooling requirements (i.e., VA, WV, KY, MO, NE, OK, OR, WA & ID; southern IN, KS, NM & AZ; northern LA, AR, MS, AL & GA; inland CA & western NV).	Gas/oil or heat pump	R-4 to R-8	R-2 to R-8
	electric resistance	R-4 to R-8	R-2 to R-8
<b>Cold</b> (i.e., PA, NY, New England, northern Midwest, Great Lakes area, mountainous area (e.g., CO, WY, UT, etc.)).	Gas/oil	R-6 to R-11	R-2 to R-11
	heat pump or electric resistance	R-6 to R-11	R-2 to R-11



## BENEFITS

Duct insulation can provide many benefits including:

**Improved comfort.** Duct insulation minimizes conductive heat losses and gains, allowing supply air to be delivered closer to design temperatures. In winter, "cold blows" will be reduced in rooms supplied with long duct runs. This can result in quicker recovery from night-time setbacks and a more consistent level of comfort throughout a house.

**Lower utility bills.** The average homeowner spends about \$700 per year on heating and cooling. Duct insulation minimizes conductive heat losses and gains and reduces heating and cooling systems' operating time. This results in lower energy bills, making homes less expensive to operate.

**Lower equipment costs.** Duct insulation can reduce space conditioning loads and, and in some cases, allows for the installation of smaller, less costly heating and cooling equipment.